

MISCELLANEOUS.

On the Organization and Affinities of Pleurotomaria.

By MM. E.-L. BOUVIER and H. FISCHER.

THE *Pleurotomaria* are the first mollusks (one might almost say the first animals) of which remains are found in the fossil state. As old as the oldest Trilobites, but curiously more tenacious of existence, they were not extinguished like the Trilobites during the Carboniferous epoch. They have left a great variety of forms in the Jurassic deposits, they were perpetuated, though somewhat feebly, through the Tertiary period, and are still represented in our day by certain species, for the most part of extreme rarity. Of these last absolutely nothing was known but the shell until the 'Blake,' under the direction of Alexander Agassiz, captured four living *Pleurotomaria* off the Antilles in 1879. From these specimens M. Dall was able to determine that the anus is still situate on the median dorsal line in the animals we are considering, that they have two branchiæ symmetrically situated, two urinary orifices also symmetrical, and that thus they present, as one might expect, by far the most primitive characters of all Gasteropods. Since that time the Japanese have found another living *Pleurotomaria*; but it was not made the subject of any research, so that the internal organization of these creatures might have remained for a long time unknown had not M. Agassiz, thanks to the courteous intervention of M. Milne-Edwards, handed over to us one of the specimens of *Pleurotomaria Quoyana* collected by the 'Blake.' We cannot sufficiently express our gratitude to the distinguished American zoologist for his liberality.

From its general organization *P. Quoyana* approaches most nearly to the Diotocardia of the most normal type (Haliotidæ, Trochidæ). Its sense-organs occupy the same position; its buccal mass appears to be built on the same type; it has the same myology, the same cerebroid and buccal ganglia, the same labial commissure, the same crossed (*croisée*) visceral commissure.

The characters which distinguish it from the other Diotocardia are:—(1) the feeble development of the epipodium; (2) the altogether peculiar origin of the branches of the visceral commissure; (3) the structure of the scalariform nervous cords which traverse the foot.

Of the "epipodial collarette" we will say nothing except that, greatly reduced as it is in general in *Pleurotomaria*, it is imperceptible in our specimen, and there is every reason for believing that in the genus under consideration we see it at the very beginning of its development.

As for the "branches of the visceral commissure," they are not in any wise detached, as in the other Diotocardia, from the most anterior portion of the nerve-cords situate in the foot; they arise from cerebro-pallial links towards the middle of their length, and

appear to be nothing more than a strong branch from them. This is, with but slight difference, the arrangement observable in the Placophores, in which the cerebro-pedal link is quite separated from the pedio-pallial (*Acanthopleura salamander*, according to Herr von Jhering, *A. Savatieri*), and where the visceral commissure is formed, following the hypothesis of Herr Bütschli, by the median and ventral fusion of the two symmetrically situated stomachal nerves (*Chiton fasciculatus* and *Ch. magnificus*, according to M. Haller; *C. cinereus*, according to Herr von Jhering).

The "scalariform nervous cords" are remarkable for the ganglionic projection, in the form of a very elongated horn, which both exhibit in front of their most anterior commissure. This horn presents along its whole length, notably on its outer side, a broad and deep furrow, which is continued upon the cords and which divides each of them into an upper pallial portion and a lower pedal; the cerebro-pallial link arises at the end of the pedal portion.

The pedal portion, behind the great anterior commissure, presents the usual accessory commissures and gives origin to numerous nerves to the lower surface of the foot; the pallial portion has no commissures, it supplies the mantle, the columellar muscle, the muscles of the upper surface of the foot, and probably also the epipodium. The pallial portion, in other words, behaves exactly like the pallial cords of the Placophores, the pedal portion like the pedal cords of these latter—so much so that the pallio-pedal cords of *Pleurotomaria* ought to be considered as the result of con-
 crescence* of the pedal cords and the ganglionic portion of the pallial cords † which one observes on each side in the Placophores.

To summarize: *Pleurotomaria* presents the first stage of a ganglionic concentration, which is more and more accentuated as one rises in the scale of mollusks. In *Haliotis* and *Trochus* the cords of the foot are composed, as has been very justly maintained by M. de Lacaze-Duthiers and by M. Boutan, of a superior pallial and an inferior pedal portion; but the pallial portion tends to isolate itself under the form of a ganglionic swelling situate in front at the origins of the visceral commissure. In the Fissurellidæ the same arrangement exists, but the cords are shorter and, in consequence, more condensed. In *Patella*, *Nerites*, *Cyclophora*, *Paludina*, and *Cypræa* the scalariform pedal cords always persist, but the pallial portion is isolated in the form of distinct ganglia; in other Gasteropods the pedal cords, like the pallial, are condensed in the form of ovoid ganglionic masses.—*Comptes Rendus*, 1897, t. cxxiv. pp. 695-697.

* According to Herren Thiele and Plate numerous anastomotic nerves attach the pallial to the pedal cords in certain Placophores; this is a first step towards the con-
 crescence realized in *Pleurotomaria*.

† As Herren von Jhering and Bütschli have shown, the pallial cords of Placophores are nothing more than the pallial ganglia fused with the great pallial nerve. As in other Gasteropods, each great pallial nerve anastomoses above the intestine with its fellow of the opposite side.